Gloucestershire COUNTY COUNCIL

Metz Way /Abbeymead Avenue

Air Quality Assessment

COGL43041187/AQ1 Revision 0

July 2016

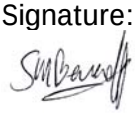
INVESTORS IN PEOPLE | Gold

INVESTORS IN PEOPLE | Champion

amey

Document Control Sheet

Project Name:	Metz Way /Abbeymead Avenue
Project Number:	COGL43041187
Report Title:	Air Quality Assessment
Report Number:	AQ1

Issue Status/Amendment	Prepared	Reviewed	Approved
First issue Rev 0	Name: John Nicklin Signature:  Date: 18/05/2016	Name: Stuart Bennett Signature:  Date: 29/07/2016	Name: Michael Peile Signature:  Date: 29/07/2016
	Name: Signature: Date:	Name: Signature: Date:	Name: Signature: Date:
	Name: Signature: Date:	Name: Signature: Date:	Name: Signature: Date:
	Name: Signature: Date:	Name: Signature: Date:	Name: Signature: Date:

Executive summary

Amey has been commissioned by Gloucestershire County Council to provide a screening air quality assessment to accompany a detailed design commission for the proposed improvement works to a section of Metz Way and Abbeymead Avenue in Gloucester.

This report includes an examination of local sensitive locations, measured ambient concentrations and a screening assessment of potential impacts on air quality in the vicinity of key sections the development site. The results are assessed against the relevant air quality criteria and the need for future assessment works is determined. The potential temporary effects of the construction phase of the proposed works are also discussed.

Temporary effects on air quality

This report assessed the temporary effects of dust during the construction of the scheme. The findings of the dust assessment establish that with appropriate mitigation there will be no significant temporary dust effects associated with the construction works.

It is recommended that the site specific mitigation measures identified in Table 2.9 are included in the Construction Environmental Management Plan.

Operational effects on air quality

The findings of the report conclude that the proposed scheme will directly impact on the movement of traffic at a number of key junctions that are in relative close proximity to a number of residential receptors. However screening calculations undertaken in line with Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 1 HA207/07 have shown that it is unlikely there will be any breaches of the air quality objectives for NO_2, PM_{10} or $PM_{2.5}$.

It is, therefore recommended that no further assessment of the temporary or operational impacts of the proposed scheme on local air quality is required.

Contents

Tables

1 Introduction

1.1 Background

1.1.1 Amey has been requested by Gloucestershire County Council (GCC) to design a number of improvements to the road network to the east of Gloucester city centre. The works are spread over approximately a 2.5km of Metz Way and Abbeymead Avenue with the aim to improve junction capacity, crossing and cycling and bus infrastructure. The full scope of the works is detailed in Table 1.1.

1.2 Purpose and scope

1.2.1 This report is a screening assessment in accordance with Design Manual for Roads and Bridges (DMRB) Volume 11 'Environment Assessment' Section 3 'Environmental Assessment Techniques' Part 1 'HA 207/07 Air quality' (DMRB 11.3.1) (Ref 1) of the potential impact the proposed scheme will have on local air quality.

1.2.2 This report also includes an assessment of the temporary nuisance effects of dust likely to be released from the construction stage of the proposed scheme with a recommendation of mitigation options. This assessment has been undertaken in accordance with Institute of Air Quality Management Guidance on the assessment of dust from demolition and construction (Ref 2).

1.2.3 There are a number of sites that make up the 'scheme' as a whole, detailed in table 1.1 below. Sites 1 and 4 necessitate the widening on the existing carriageway. Although the widening is less than 5m, which is a criteria used to define 'affected' roads in DMRB, the impact of this widening on local receptors has been screened in accordance with DMRB HA 207/07.

Table 1.1 Summary of the scope of works

Site No	Location	Description of works
1	Metz way/Eastern Avenue Junction	Widen the carriageway to extend the left turn lane and the 3 lane approach. (Reduce delays and increase the capacity of the junction.)
2	Metz Way / St Laurence Road Crossing	Upgrade crossing point to nearside Toucan
3	Coney Hill Road to North	Provide improved off carriageway shared

	Upton Lane	use footway/cycleway facilities
4	North Upton Lane/Abbeymead Avenue Junction	Widen the carriageway to provide an additional left turn lane. (Reduce delays and increase the capacity of the junction.)
5	Roman Road Roundabout eastern crossing	Upgrade controlled crossing point to Toucan
6	Abbeymead Avenue/ Kimberland Way/Abbots Road Junction	Upgrade Traffic Signals to MOVA and Bus Priority. Pedestrian facilities upgraded
7	Mead Way crossing	Upgrade controlled crossing point to Toucan

2 Assessment of temporary (construction) effects

2.1 Purpose and scope of this section

2.1.1 This section assesses the potential temporary effects on air quality during demolition and construction.

2.2 National legislation relating to dust

2.2.1 Dust can broadly be considered in two states; firstly while it is suspended in the air and secondly once it has settled out of the air and deposited onto surfaces. Statutory standards exist for suspended dust with an aerodynamic diameter of less than 10µg/m^3 (PM_{10}) and these Air Quality Objectives are described below. However, for deposited dust (and its tendency for causing a loss of amenity and/or nuisance), no UK statutory standards or limits currently exist.

Environmental Protection Act 1990

2.2.2 Section 79 of the Environmental Protection Act (EPA) 1990 (Ref 3) states that where a statutory nuisance is shown to exist, the Local Authority must serve an abatement notice. Statutory nuisances are defined as:

- any dust or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance
- any accumulation or deposit which is prejudicial to health or a nuisance.

2.2.3 Failure to comply with an abatement notice is an offence and, if necessary, the Local Authority may abate the nuisance and recover expenses, as well as potentially seeking prosecution for breach of the notice.

Environment Act 1995

2.2.4 Under Part IV of the Environment Act (Ref 4), the UK Air Quality Strategy defines a standard of 50 µg/m^3 for ambient concentrations of PM_{10} as a running 24-hour mean.

2.2.5 This limit is for the exposure of the general populace and must not be exceeded more than 35 times in the year. Therefore, following completion of an assessment process, if a Local Authority believes that this (or any other) air quality objective will not be met, it is obliged to declare an Air Quality Management Area within which the aim is to work towards the attainment of that objective.

2.3 Methodology

2.3.1 In terms of effects, construction sites can give rise to annoyance due to the soiling of surfaces by dust. Very high levels of soiling can also damage plants and affect the diversity of ecosystems. Additionally, there is evidence of major construction sites increasing long term PM_{10} concentrations and the number of days when PM_{10} concentrations exceed 50µg/m^3, the daily limit value for this pollutant. Exposure to PM_{10} has long been associated with a range of health effects.

2.3.2 The main effect of dust emissions, if not mitigated, is annoyance due to soiling of surfaces, particularly windows, cars and laundry. However, it is normally possible, by implementation of proper on-site control, to ensure that dust deposition does not give rise to significant adverse effects.

2.3.3 This chapter follows the guidance stated in the Institute of Air Quality Management (IAQM) 'Guidance on the assessment of dust from demolition and construction' the full methodology of which is detailed in Appendix A. This assesses the potential air quality effects from the project that occur:

- During the construction of the project, i.e. temporary effects.

2.3.4 This assessment compares the difference in the air quality climate between baseline year and a future assessment year scenarios. The baseline and future years for the assessment of temporary air quality effects (i.e. from construction activities) are as follows:

- The baseline year is that immediately prior to the start of works.
- The future year is a year during the period of construction works.

Table 2.1 Assessment years

Assessment scenarios	Baseline year	Future year
Construction	2016 (prior to the start of works)	2017 (during the works)

2.3.5 The assessment is only undertaken if there are sensitive receptors which could be potentially affected by construction dust. Table 2.2 shows the screening criteria to determine if these sensitive receptors exist.

Table 2.2 Construction dust screening criteria

Receptor type	Screening criteria
A 'human receptor' within	• 350m of the boundary of the site; or • 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s)
An 'ecological receptor' within	• 50m of the boundary of the site; or • 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s)

2.3.6 The assessment of the risk of dust effects is made separately for each potentially adverse construction stage and takes account of:

- the sensitivity of the area (determined from the sensitivity of receptors and the number of receptors); and
- the scale and nature of the works (construction stage), which determines the potential dust emission magnitude at that construction stage.

2.3.7 These two factors (i. sensitivity of the area and ii. scale and nature of the works) are combined to give the risk of dust effects. These dust effects are split for each construction stage into:

- dust soiling effects;
- effects on human health of PM_{10}; and
- ecological effects.

2.4 Study area

2.4.1 For the purpose of this report, the study area is defined as Sites 1 and 4 of the scheme.

2.4.2 In line with IAQM Guidance on dust, the study area for temporary air quality effects is defined by a 350m boundary from the scheme for human receptors and a 50m boundary from the scheme for ecological receptors.

2.4.3 The area immediately surrounding this section of the highway has a number of residential and commercial properties though a review of Department of Environment Farming and Rural Affairs (Defra) Multi Agency Geographical Information for the Countryside (MAGIC) (Ref 5) confirms that there are no relevant designated sites within 50m of the proposed scheme, with the closest being the Robins Hill Quarry SSSI approximately 2km to the south west of the proposed construction area.

2.4.4 There are a total of 1289 residential, 3 community, 73 commercial within 350m of the project and 1 ecological receptor within 50m of the scheme as shown in Figure B.1 Appendix B and Table 2.3 below.

Table 2.3 Sensitive receptors within the study area for temporary effects

Cumulative distance bands (m)	Number of receptors			
	Residential	Community	Ecological*	Commercial
0-20	9	0	0	1
0-50	46	0	0	3
0-100	135	0		11
0-150	258	0		33
0-200	649	2		58
0-350	1289	3		73

* Based on the revised scheme there are no ecological receptors within 50 m, and as such these impacts have been screened out.

2.5 Baseline conditions relevant to dust

2.5.1 Under Part IV of the Environment Act 1995 it is a requirement to publish an Air Quality Strategy and establish a system of local air quality management. Local authorities are required to review and assess air quality in their area and to designate Air Quality Management Areas where air quality objectives are unlikely to be met. Where an AQMA has been declared an Air Quality Action Plan, aiming to reduce pollutant levels to meet the objectives, needs to be produced.

2.5.2 A review of the 2014 Air Quality Progress Report for Gloucester City Council (Ref 7) confirmed that the Council has not declared any AQMAs for PM_{10}. The report also confirms that the Council do not currently monitor for PM_{10}.

2.5.3 As there are no local sites deemed representative of local background PM_{10} in the assessment area for 2016 and 2017 the background concentrations for PM_{10} were obtained from the latest DEFRA pollutant background maps (Ref 14). These maps provide a modelled background pollutant concentration for each OS 1km×1km grid square in the UK detailed in Table 2.4.

Table 2.4: Background concentrations for PM_{10} in different years from the Defra's background maps 2011 for grid ref 385500 217500

Year	PM_{10} ($\mu g/m^3$)
2016(prior to construction)	15.1
2017(year of construction)	15.0

2.6 Impact Assessment

2.6.1 At the time of writing, the actual construction phase programme, equipment and methodology is unknown. The level of detail, sequence and durations will be developed further in the construction-phase programme following completion of detailed design and appointment of the successful contractor. However, this report is based on a robust initial assessment of the construction phase programme using the best-available knowledge at the time of preparation. This assessment has taken a 350m boundary around sites 1 and 4 as detailed in Figure B.1 in Appendix B.

2.6.2 Overall, the following activities on this site are considered to have the potential to generate dust emissions.

- Earthworks: including the removal of topsoil, handling on site and deposition, construction of cuttings and embankments, stockpiling and handling of loose materials (including loading and unloading of materials).
- Construction: including the provision, modification or refurbishment of a structure,
- Track out: vehicle movements, causing re-suspension of road dust, particularly on unmade roads.

2.6.3 To cause nuisance, dust must be generated, become airborne and reach a receptor, and that receptor can be human or ecological. The sensitivity of the area is defined from the sensitivity of receptors in the study area and the number of them in each distance band as detailed in Table 2.3 above.

2.6.4 Table 2.5 shows the sensitivity of receptors within the study area for temporary effects. For dust soiling, the sensitivity of receptors is high due to residential receptors being within 350 m. Residential receptors can reasonably expect a high level of amenity and the appearance and aesthetics of their property would be diminished by dust soiling.

2.6.5 The sensitivity of receptors to PM_{10} is also assessed as being high as there is a possibility that members of the public could be exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location is one where individuals may be exposed for eight hours or more in a day such as a residential property). Based on a revised scheme there are no ecological receptors within 50 m, and as such these impacts have been screened out.

Table 2.5 Determination of the sensitivity of receptors

Dust effect	Relevant definition	Sensitivity of receptors
Dust soiling effects	Residential dwellings	High
Human health effects of PM_{10}	Location where individuals can be exposed for 8 hours or more in a day	High
Ecological effects	No designated sites within 50 m of the scheme boundary	N/A

2.6.6 In accordance with the IAQM Guidance on the assessment of dust from demolition and construction only the highest level of receptor sensitivity need be considered. In the case of this scheme having between 1-10 receptors within 20m is considered the worst case. According to Table A.4 in Appendix A this rates the sensitivity to dust soiling as being medium.

2.6.7 According to Table A.5 in Appendix A the sensitivity of the area to human health effects of PM_{10} has been defined as low as there are 1-10 receptors within 20m and the background ambient concentration of PM_{10} for 2016 is 15.1µg/m^3.

2.6.8 Table 2.6 shows the sensitivity of the area to dust soiling and to health effects of PM_{10}, which were calculated from the number of receptors as detailed in Table 2.3 and the sensitivity of receptors as detailed in Table 2.5 above.

Table 2.6 Determination of the sensitivity of the area

Dust Effect Sensitivity	Relevant definition	Sensitivity of the area
Dust soiling	1-10 receptors within 20m	Medium
Human health of PM_{10}	15.1µg/m^3 PM_{10} (background concentration 2016) 1-10 receptors within 20m	Low

2.6.9 The potential dust emission magnitude is based on the scale and nature of the anticipated works and is classified as small, medium or large (see criteria in Tables A.7, A8, A9 and A10 in Appendix A). Table 2.7 shows the potential dust emission magnitude for each of the activities expected during the works.

Table 2.7 Determination of the potential dust emission magnitude

Construction stage	Relevant definition	Potential dust emission magnitude
Earthworks	Total site area <2 ,500m^2, <5 heavy earth moving vehicles active at any one time, No formation of bunds required	Small
Construction	Total construction area <25,000m3 All works <10m in height	Small
Track out	<10 HDV (>3.5t) outward movements in any one day with no unpaved road.	Small

2.7 Significant effects

2.7.1 The significance of effects has been determined for both dust soiling and human health.

2.7.2 The sensitivity of the area has been defined for both dust soiling and human health impacts as shown in Table 2.6. The dust emission magnitude for each phase of the construction has then been defined as detailed in Table 2.7. Table 2.8 below summarises the risk of dust impacts to both dust soiling and human health effects for each stage of the construction.

Table 2.8 Summary dust risk table to define site-specific mitigation

Dust effect (sensitivity of the area to the specific dust effect)	Construction Phase (potential dust emission magnitude)		
	Earthworks (Small)	Construction (Small)	Track out (Small)
Dust soiling (Medium)	Low Risk	Low Risk	Negligible
Human health of PM_{10} (Low)	Negligible	Negligible	Negligible

2.8 Proposed Mitigation

2.8.1 The dust impact assessment has demonstrated that for the majority of the activities associated with the construction of the scheme that there is a negligible to low risk of dust nuisance given the proximity of the receptors, the sensitivity of these receptors and the dust emission magnitude of each construction phase.

2.8.2 Table 2.9 outlines the recommended mitigation to avoid significant adverse temporary (construction) effects on air quality for this site.

Table 2.9 Summary dust risk table to define site-specific mitigation

Mitigation measure	Low risk
Mitigation for all sites	
Communications	
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	Highly recommended
Display the head or regional office contact information	Highly recommended
Dust management plan	
Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real time PM10 continuous monitoring and/or visual inspections.	Desirable
Site Management	
Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	Highly recommended
Make the complaints log available to the local authority when asked.	Highly recommended
Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	Highly recommended
Monitoring	
Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture,	Desirable

Mitigation measure	Low risk
cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.	
Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked	Highly recommended
Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	Highly recommended
Preparing and maintaining the site	
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	Highly recommended
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	Highly recommended
Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period	Desirable
Avoid site runoff of water or mud.	Highly recommended
Keep site fencing, barriers and scaffolding clean using wet methods.	Desirable
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	Desirable
Cover, seed or fence stockpiles to prevent wind whipping.	Desirable
Operating vehicle/machinery and sustainable travel	
Ensure all vehicles switch off engines when stationary - no idling vehicles.	Highly recommended
Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	Highly recommended
Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate)	Desirable
Operations	
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local	Highly recommended

Mitigation measure	Low risk
exhaust ventilation systems	
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate	Highly recommended
Use enclosed chutes and conveyors and covered skips.	Highly recommended
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	Highly recommended
Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	Desirable
Waste management	
Avoid bonfires and burning of waste materials.	Highly recommended
Measures specific to construction	
Avoid scabbling (roughening of concrete surfaces if possible).	Desirable
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	Desirable
Measures specific to track out	
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.	Desirable
Avoid dry sweeping of large areas.	Desirable
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	Desirable
Record all inspections of haul routes and any subsequent action in a site log book.	Desirable
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	Desirable

2.9 Residual Effects

2.9.1 With the highly recommended mitigation measures put in place, it is considered that no residual effects will exist.

3 Screening Assessment of Permanent (operational) effects from road traffic

3.1 Purpose and scope of this section

3.1.1 This section assesses the potential permanent effects on air quality that any traffic associated with the operation of the worst case option may have on local concentrations of NO_2, PM_{10} and $PM_{2.5}$.

3.2 Regulatory and policy framework relating to Local Air Quality

European Directive 2008/50/EC on ambient air quality and cleaner air for Europe

3.2.1 The 2008 ambient air quality directive (Ref 8) sets legally binding limits for concentrations in outdoor air of major air pollutants that impact public health such as particulate matter (PM_{10} and $PM_{2.5}$) and nitrogen dioxide (NO_2). As well as having direct effects, these pollutants can combine in the atmosphere to form ozone, a harmful air pollutant (and potent greenhouse gas) which can be transported great distances by weather systems.

3.2.2 The 2008 directive replaced nearly all the previous EU air quality legislation and was made law in England through the Air Quality Standards Regulations 2010 (Ref 9).

National air quality strategy

3.2.3 The UK Government is required under the Environment Act 1995 to produce an Air Quality Strategy (Ref 10). This was last reviewed and published in 2007. The strategy sets out the UK's air quality objectives and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. It prescribes air quality objectives for ten pollutants (benzene, 1,3-butadiene, carbon monoxide, lead, polycyclic aromatic hydrocarbons, nitrogen dioxide, sulphur dioxide, particles – PM_{10} and $PM_{2.5}$ and ozone).

3.2.4 Part IV of the Environment Act 1995 requires local authorities in the UK to review air quality in their area and designate air quality management areas (AQMA) if improvements are necessary. Where an air quality management area is designated, local authorities are also required to work towards the Strategy's objectives prescribed in regulations for that purpose. An air quality action plan describing the pollution reduction measures must then be put in place. These plans contribute to the achievement of air quality limit values at local level.

National Planning Policy Framework

3.2.5 The National Planning Policy Framework (NPPF) (Ref 11) was published on 27 March 2012 and sets out the Government's planning policies for England and how these are expected to be applied. The purpose of the NPPF is to help achieve sustainable development.

3.2.6 Section 109 states that the planning system should contribute to and enhance the natural and local environment by, among others, preventing new development from contributing to unacceptable levels of air pollution.

3.2.7 Section 124 states that planning policies should sustain compliance with and contribute towards EU limit values and national objectives for pollutants, taking into account the presence of air quality management areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in air quality management areas is consistent with the local air quality action plan.

3.2.8 For road traffic sources, the pollutants of particular concern are oxides of nitrogen (NO_x and NO_2) and particulate matter (PM_{10} and $PM_{2.5}$), which are the most likely pollutants to exceed or approach Air Quality Strategy objectives and the EU limit values. NO_2, PM_{10} and $PM_{2.5}$ are of concern in relation to human health, whereas oxides of nitrogen (NO_x) are of concern in relation to vegetation and ecosystems. Table 3.1 lists the key traffic related air quality thresholds.

Table 3.1: Objectives for key traffic related pollutants

Pollutant	Air Quality threshold	Measured as
Nitrogen Dioxide (NO_2)	200$\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean
	40$\mu g/m^3$	Annual mean
Oxides of Nitrogen (NO_x)	30$\mu g/m^3$	Annual mean

Pollutant	Air Quality threshold	Measured as
All Authorities Particles (PM_{10}) (gravimetric)	40μg/m^3	Annual mean
	50μg/m^3, not to be exceeded more than 7 times a year	Daily mean
All Authorities Particles ($PM_{2.5}$) (gravimetric)	25μg/m^3(target)	Annual Mean
	15% cut in urban background exposure	Annual Mean

Local Policy Framework

3.2.9 Gloucester City Council reviewed its Air Quality Action Plan 2008 in 2011 (Ref 16). The plan details the measures the council will take in order to achieve the annual mean air quality objective for NO_2 in the 3 AQMAs that are currently declared in Gloucester. None of these measures specifically relate to the proposed scheme but all of the measures aim to improve congestion or reduce through traffic through those areas of exceedance.

3.2.10 The draft Joint Core Strategy for Gloucester, Cheltenham and Tewkesbury 2014 (Ref. 11) has yet to be adopted. It contains Strategic objective number 9 that relates to air quality, which states that:

"Promote development that contributes to a healthy population by:

.....Ensuring that environmental quality and air quality is protected"

3.2.11 The Local Transport Plan for Gloucestershire (LTP3) (Ref 12) sets out the transport strategy for the County from 2011 to 2026. Policy P5e states that;

"Through the planning process, developers and scheme promoters will be required to undertake assessments to determine if their development or scheme will be subject to or create poor air quality or noise in excess of the thresholds as advised by Government and to commit to mitigating those effects."

3.3 Methodology and Study Area

3.3.1 This section follows the guidance stated in the Design Manual for Roads and Bridges (DMRB) Volume 11 'Environment Assessment' Section 3 'Environmental Assessment Techniques' Part 1 'HA 207/07 Air quality' (DMRB 11.3.1) for the screening of potential air quality effects as a result of the proposed scheme.

3.3.2 This screening assessment considers the current air quality climate in vicinity of the proposed scheme and determines if there are likely to be significant impacts as a result and what level of further assessment if any will be required.

3.3.3 The air quality assessment for a road scheme has two main elements. The first of these is the estimation of roadside air pollution concentrations, referred to as local impacts, associated with new or modified road schemes. The second is an estimation of total annual emissions arising from a road scheme, referred to as regional impacts.

3.3.4 The screening assessment methodology detailed in DMRB HA 207/07 which states that an air quality assessment should be undertaken if a proposed scheme results in any of the following criteria being met:

- road alignment will change by 5m or more; or
- daily traffic flows will change by 1000 AADT or more; or
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more; or
- daily average speed will change by 10km/h or more; or
- peak hour speed will change by 20km/h or more.

3.3.5 A regional assessment is required if affected roads are those that are expected to have:

- a change of more than 10% in AADT; or
- a change of more than 10% to the number of heavy duty vehicles; or
- a change in daily average speed of more than 20 km/h.

3.3.6 DMRB HA 207/07 also states that if construction is expected to last for more than six months the effect of the additional constructional vehicles should be assessed as an additional scenario, though this can be a qualitative assessment if detailed traffic flows are not available.

3.3.7 Though there is no requirement in DMRB HA207/07 to assess for $PM_{2.5}$ guidance in the recently revised and published LAQM TG (16) (Ref 17) should be considered. While LAQM TG (16) does not place a statutory duty on local authorities to monitor or assess for $PM_{2.5}$, it does recommend a new flexible role in working towards reducing emissions and concentrations of $PM_{2.5}$. Therefore in the interests of completeness this pollutant has also been assessed.

3.3.8 The DMRB Screening tool currently has no facility to model $PM_{2.5}$ therefore in accordance with paragraph B.16 of Appendix B in LAQM TG (16) where no appropriate local sites measuring both PM_{10} and $PM_{2.5}$ are available, then a nationally derived correction ratio of 0.7 can be used. This factor has been applied to the modelled PM_{10} outputs as detailed in table 4.8.

3.3.9 In the case of this Scheme, there will be a widening of the carriageway at 2 locations (Sites 1 and 4), though it is likely the widening will not be in excess of 5 m. It is not anticipated that, as a result of the proposed scheme, flows will change by more than 10% or speeds increase by more than 20km/h and in accordance with DRMB HA 207/07 no regional air quality assessment is required. It is not anticipated that each individual section of the works will take longer than 6 months.

3.3.10 A desk top review of publicly available information was carried out to undertake this assessment. At this stage, properties and designated sites within 200m of the options were identified through review of Ordnance Survey mapping. Counting was undertaken using ArcView Geographical Information System (GIS). These receptors are detailed below in table 3.2 and in Figure B.2 in Appendix B.

Table 3.2 Sensitive receptors within the study area for permanent effects

Distance bands (m)	Number of receptors			
	Residential	**Community**	**Commercial**	**Ecological**
0-50	46	0	3	0
50-100	89	0	8	-
100-150	123	0	22	-
150-200	391	2	25	-
Total	**649**	**2**	**58**	**0**

3.3.11 In terms of properties, particular attention is paid to sensitive receptors such as schools, hospitals, the young and the elderly, there are no such receptors within 200m of the proposed works. Areas likely to experience higher than average air pollutant concentrations, such as roundabouts and junctions, are also identified, in the case of this scheme the Eastern Avenue Junction Westbound approach, Westbound approach to Coney Hill Road roundabout and the Abbeymead Avenue / North Upton Lane.

3.3.12 Designated sites that include habitats sensitive to air pollution are only considered, and geological sites are not included.

3.4 Baseline conditions relevant to Local Air Quality

3.4.1 The proposed scheme is located to the east of Gloucester City Centre. The surrounding area can be considered suburban in nature though towards the western extent of the scheme there are fewer residential properties as these are replace with commercial and retail outlets. The closest residential receptors to Site 1 are well beyond 200m and in accordance with DMRB HA207/07 the widening at his location can be screened out for requiring further assessment. However site 4 has a number of residential receptors that are adjacent to the proposed works.

3.4.2 The main source of pollution in this area is likely from the traffic that uses Metz Way and Abbeymead Avenue. The Department of Transport (Ref 12) maintain a traffic count point on Metz Way approximately 400m to the west of the western extent of the scheme; the latest count data from 2014 shows an AADT of 17,929 vehicles with 1% of these movements being HGVs. Dft also monitor traffic on Eastern Avenue, the latest count data from 2014 shows an AADT of 32,777 and a HGV split of 2.2%.

3.4.3 Amey also undertook Automatic Traffic Counts (ATC) in March 2016 and also a manual turn count at a number of key junctions, including site 4. This traffic data has been used to undertake the screening calculations.

3.4.4 A review of the 2014 Air Quality Progress Report for Gloucester City Council (Ref 13) shows that Gloucester City Council currently has three AQMAs; the Painswick Road AQMA “An area encompassing a number of properties on either side of Painswick Road, Gloucester”., Barton Street AQMA “An area encompassing Barton Street, Gloucester from its junction with Trier Way/Bruton Way to the north west and Upton Street to the south east” and Priory Road AQMA “An area encompassing the junction of St Oswalds Road and Priory Road”. The closest of these AMQAs is the Painswick AQMA that is situated approximately 850m to the south west of the proposed scheme. All of the AQMAs have been declared due to emissions from road transport resulting in an exceedance of the annual mean air quality objective for NO_2.

3.4.5 The 2014 Progress Report for Gloucester City Council concluded that the existing AQMAs should be maintained due to the continued exceedance of the annual mean air quality objective for NO_2 at a number of locations within the AQMAs.

3.4.6 As detailed in the 2014 Air Quality Progress Report for Gloucester City Council the council maintains one automatic and a wider network of passive monitoring stations for NO_2 and PM_{10}. The closest continuous monitoring is located at grid reference x383690, y218102 and is approximately 1.3km to the west of the proposed scheme area. This station is a roadside continuous station that monitors for NO_2 by Chemiluminesence the results of which for the years 2010 to 2013 are detailed below in table 3.3.

Table 3.3 Measured NO_2 by continuous monitoring at locations close to the study area

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3)			
			2010	2011	2012	2013
CM1 Barton Street	Roadside	Y	46	44	44	37.2
			Daily Mean number of exceedances(Days)			
			0	0	0	0

3.4.7 The council also monitors at an additional 25 locations using passive diffusion tubes. The closest of these passive monitoring sites to the proposed scheme is located adjacent to Metz Way flyover at grid reference x384190 y218160. This monitoring site has not exceeded the annual mean air quality objective for NO_2 for the last four years. The closest urban background site is over 1km to the north west of the scheme, though this is not considered representative of the background NO_2 in proximity to the scheme the bias corrected results for the years 2010 to 2013 are detailed in table 3.4.

Table 3.4 Measured NO_2 by diffusion tube at locations within or close to the study area

Site ID	Site Type	Within AQMA?	Annual Mean NO_2 Concentration (µg/m^3) – Adjusted for Bias			
			2010 Bias correction factor 0.77	2011 Bias correction factor 0.85	2012 Bias correction factor 1.01	2013 Bias correction factor 0.95
1	Urban Background	N	19.9	21.7	22.3	22.2
3	Roadside	N	32.4	29.2	31.7	36.6*

* annualised results in accordance with LAQM TG(09)

3.4.8 As there are no local sites deemed representative of local background air quality in the assessment area for 2016 and 2017 the background concentrations for NO_x, NO_2, PM_{10} and $PM_{2.5}$ were obtained from the latest DEFRA pollutant background maps (Ref 14). These maps provide a modelled background pollutant concentration for each OS 1km×1km grid square in the UK detailed in table 3.5.

Table 3.5 Background concentrations for NO_x, NO_2 and PM_{10} in different years from the Defra's background maps 2011 for grid ref 385500 217500

Year	NO_x ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)
2016	20.9	15.3	15.1	10.5
2017	20.2	14.8	14.9	10.3

3.4.9 At the time of writing there is only baseline traffic data available for 2016 which have been taken from the ATC and manual counts undertaken by Amey adjacent to the scheme. No traffic modelling has been undertaken for future "do something" screening scenarios. A number of simple screening calculations have been undertaken to establish the potential impact of the scheme on local air quality and these do not constitute a full air quality assessment.

3.4.10 In order to undertake simple screening calculations in accordance with HA 207/07 AADT traffic data has been obtained from Amey ATC and manual counts undertaken in 2016. The counts that are relevant to the receptors are listed and the total AADT and HGV % totals are detailed in table 3.6. In the absence of any speed data reduced speeds have been used in this screening assessment in order to replicate worst case congested conditions.

Table 3.6 Receptor Location and traffic data

Receptor	Receptor Grid Ref		Distance to closest centreline (m)		Road Ref	Total AADT	HGV %	Speed Km/h
	x	y	DM	DS				
SR1 (24 Pinery Road)	386164	217270	26.5	24.5	Abbeymead Avenue	11698	2.5%	25

Receptor	Receptor Grid Ref		Distance to closest centreline (m)		Road Ref	Total AADT	HGV %	Speed Km/h
	x	y	DM	DS				
SR1 (24 Pinery Road)	386164	217270	78.2	78.2	North Upton Lane	7186	2.5%	25
SR2 (1 Stone Close)	386198	217263	15.1	15.1	North Upton Lane	7186	2.5%	25
SR2 (1 Stone Close)	386198	217263	24.9	24.9	Abbeymead Avenue	11698	2.5%	25
SR3 (29 Harleys Field)	385766	217307	30.3	24.5	Abbeymead Avenue	15293	2.5%	25
SR4 (36 Harleys Field)	385823	217298	16.0	13.3	Abbeymead Avenue	15293	2.5%	25
SR3 (29 Harleys Field)	385766	217307	26.4	26.4	Coney Hill Road	4394	2.5%	25
SR4 (36 Harleys Field)	385823	217298	85.1	85.1	Coney Hill Road	4394	2.5%	25

3.4.11 The ATC situated on Metz Way, though providing total counts, did not include speed data or HGV %. However a 12 hour manual count undertaken at Metz Way/North Upton Lane turning assessed the HGV as 2% Eastbound and 3% Westbound, an average of these percentages has been used of 2.5%. In order to scale up the 12 hour count data to 24 hour data a factor of 1.2 has been calculated from the ATC count data.

3.4.12 In order to replicate the speed conditions on the shorter more congested links, particularly within 100m of the junction the speeds have been reduced. The speeds were reduced in accordance with IAN 185/15 (Ref. 20). As detailed in the advice note light conditions have a speed range of between 30kph and 45kph, while heavy conditions are characterised by speeds of less than 20kph.

3.4.13 As stated in Highways England IAN 185/15 “Driving styles close to junctions are associated with increased periods of acceleration associated with traffic starting and clearing the junction. To account for this increase in engine load it is recommended that within a 100m radius of the centre of the junction in all directions that at least the light congestion emissions, and in some instances heavy congestion emissions should be used depending on the driving conditions during that period.”

3.5 Impact Assessment

3.5.1 A screening assessment of air quality within 200m of the affected roads around the proposed scheme has been undertaken, in order to assess the potential impact of the new scheme on the closest residential receptors, designated AQMAs and within the wider network considered to be affected.

3.5.2 Though the wider scheme consists of 7 sites, in accordance with HA207/07 only 2 sites require further screening. Sites 1 and 4 involve the widening of the carriageway that would result in the traffic and thereby the emissions being in closer proximity to adjacent receptors. Though site 1 requires widening a review of the location shows that there are no relevant receptors that will be impacted on by this change. Site 4 has residential receptors that are adjacent to the widening.

3.5.3 Site 4 will see a widening to Abbeymead Avenue in order to provide a left turn to North Upton Lane. These improvements and widening aim to reduce delays and increase the capacity of the junction which could also reduce associated emissions. However the distance between the traffic and the receptors on Harleys Field and Pinery Road will reduce.

3.5.4 There are 649 residential receptors within 200m of the proposed scheme as detailed in figure B.2 in Appendix B and Table 3.2 above.

3.5.5 Four representative worst case receptors have been chosen in proximity to sections of the highway that will be subject to a change in alignment or flow as a result of the proposed scheme. The location of the receptors and their respective distance to the existing centreline are detailed in table 3.6.

3.5.6 For the purposes of the screening assessment, and in the absence of a traffic model, it has been assumed that there will be no increases to the AADT, therefore in this screening assessment the only parameter that has changed is the distance between the current alignment and the proposed alignment in order to highlight the impact this will likely have on levels of both NO_2, PM_{10} and $PM_{2.5}$.

3.5.7 Tables 3.7, 3.8 and 3.9 below detail the predicted changes in the concentration of NO_2, PM_{10} and $PM_{2.5}$.at the four worst case receptors. Receptor SR3 is predicted to experience the largest increase in ambient concentrations (when compared the Do-Minimum and the Do-Something scenarios) of all of the pollutants of interest. It is also noted that these simple screening calculations, though using limited traffic data and in the absence of any growth, have shown that it is unlikely there will be any exceedance of the air quality objectives as detailed in table 3.1.

Table 3.7 Predicted NO_2 concentration at specific receptors in 2016 and in 2017

Receptor	Base 2016 NO_2 $\mu g/m^3$	2017 NO_2 $\mu g/m^3$ DM	2017 NO_2 $\mu g/m^3$ DS	Change DS-DM +/- $\mu g/m^3$
SR1	18.1	17.6	17.7	0.13
SR2	19.8	19.2	19.2	0.00
SR3	19.0	18.4	18.9	0.44
SR4	19.6	19.0	19.3	0.29

Table 3.8 Predicted PM_{10} concentration at specific receptors in 2016 and in 2017

Receptor	Base 2016 PM_{10} $\mu g/m^3$	2017 PM_{10} $\mu g/m^3$ DM	2017 PM_{10} $\mu g/m^3$ DS	Change DS-DM +/- $\mu g/m^3$
SR1	15.9	15.7	15.7	0.03
SR2	16.3	16.2	16.2	0.00
SR3	16.1	16.0	16.1	0.12
SR4	16.3	16.1	16.2	0.08

Table 3.9 Predicted PM2.5 concentration at specific receptors in 2016 and in 2017

Receptor	Base 2016 PM_{10} $\mu g/m^3$	2017 PM_{10} $\mu g/m^3$ DM	2017 PM_{10} $\mu g/m^3$ DS	Change DS-DM +/- $\mu g/m^3$
SR1	11.1	11.0	11.0	0.02
SR2	11.4	11.3	11.3	0.00
SR3	11.3	11.2	11.2	0.09
SR4	11.4	11.3	11.3	0.06

3.6 Compliance Risk Assessment

3.6.1 Development projects are also required to assess the impacts of their scheme on compliance with the EU Directive on ambient air quality (2008/50/EC). IAN 175/13 (Ref 15) prepared by the Highways England sets out the assessment approach for identifying and quantifying impacts of a scheme on Defra's 'UK National Compliance Assessment for the EU Directive on ambient air quality'. This approach uses the reported information from Defra's Pollution Climate Mapping (PCM) model and the results obtained in this air quality assessment.

3.6.2 A review of DEFRA's UK Ambient Air Quality Interactive Map (Ref 16) shows that scheme does not fall on a compliance risk road and therefore this can be screened out of requiring further assessment.

3.7 Residual Effects

3.7.1 The permanent effect of the proposed scheme on local air quality within the scheme area has been assessed at 2 worst case locations. It is not considered that any significant residual effects remain once the scheme becomes operational.

4 Assessment of cumulative effects

4.1.1 No other projects in the area which could affect the traffic flows were identified beyond those already considered in the traffic model.

5 Conclusions

5.1 Summary of significant effects

5.1.1 In terms of permanent impacts on local air quality there is a significant likelihood that the scheme will impact on the movement of traffic and therefore the local air quality at a number of key junctions. The proposed scheme will alter the flow of traffic on a number of key routes that will in turn impact on the levels of both NO_2 PM_{10} and $PM_{2.5}$.

5.1.2 The proposed scheme includes widening at 2 locations, though only one of these locations has relevant receptors within 200m. The simple screening calculations have shown that it is unlikely that there will be a breach of the air quality objectives for NO_2, PM10 and $PM_{2.5}$.

5.1.3 As discussed, a traffic model is not available at the time of writing and the potential improvements to the congestion at the sites 1 and 4, and its impact on emissions have not been considered in this screening assessment nor has any traffic growth been modelled. As such it is possible the increase in concentrations could be higher or lower than those predicted in this screening assessment, though a breach of the air quality objectives is considered highly unlikely given the results of the screening calculations both with and without the scheme.

5.1.4 It is, therefore recommended that no further assessment of the operational impacts of the proposed scheme on local air quality is required.

5.1.5 The potential adverse effects of dust soiling and PM_{10} associated with the temporary construction stage have been assessed in accordance with the latest IAQM guidance on the assessment of dust from demolition and construction. This assessment has concluded that the risk of adverse effects of PM_{10} on human health is negligible. The potential adverse effects of dust soiling on people are low and through mitigation become negligible. Due to the absence of any ecological sites in relevant proximity to the scheme it has been assessed that there are no adverse effects on ecological receptors.

5.2 Summary of mitigation measures

5.2.1 It is recommended that the site specific mitigation measures identified in Table 2.9 be included in a Dust Management Plan (DMP).

5.2.2 Mitigation is not deemed necessary for the operational phase of the proposed scheme in terms of ambient air quality.

6 References

1 HIGHWAYS AGENCY (2007). Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 1 HA 207/07 Air Quality.

2 INSTITUTE OF AIR QUALITY MANAGEMENT (2014). Guidance on the assessment of dust from demolition and construction.

3 UNITED KINGDOM, Environmental Protection Act 1990.

4 UNITED KINGDOM, The Environment Act 1995.

5 DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS (Defra). (Multi Agency Geographical Information for the Countryside (magic), http://www.magic.gov.uk/ 2015

6 MAIDSTONE BOROUGH COUNCIL (2013) Local Air Quality Management Annual Progress Report.

7 DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS (Defra). Background maps to assist local authorities in support of review and assessment of local air quality.

8 European Union, Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

9 United Kingdom, Air Quality Standards Regulations 2010

10 United Kingdom, 'The Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007'

11 Department for Communities and Local Government, National Planning Policy Framework, 27 March 2012

12 Maidstone Borough Council, "Interim Approval of Maidstone Borough Local Plan Policies" 13 March 2013

13 Maidstone Borough Council, Local Air Quality Management Maidstone Town Air Quality Action Plan, 2010

14 Maidstone Borough Council," Maidstone Integrated Transport Strategy 2012 – 2026 Public Consultation" 2012

15 Kent County Council (2011) Local Transport Plan for Kent 2011-16.

16 Highways Agency (2013) Interim Advice Note 174/13 (IAN) Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA207/07).

17 DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS (Defra). (2016) Local Air Quality Management Technical Guidance LAQM.TG (16).

18 Highways England (2013) Interim Advice Note 175/13(IAN) Updated air quality advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for user of DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA207/07).

19 DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS (Defra). (2015) http://uk-air.defra.gov.uk/data/gis-mapping

20 DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS (Defra). (2011) Trends in NOx and NO2 emissions and ambient measurements in the UK

21 Highways Agency (2013) IAN 170/12 v3INTERIM ADVICE NOTE 170/12 v3 Updated air quality advice on the assessment of future NOx and NO2 projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality

22 Highway England (2015) Interim Advice Note 185/15(IAN) Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands 'for users of DMRB Volume 11,Section 3, Part 1 'Air Quality and Volume 11, Section 3. Part 7NoiseUpdated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA207/07).

Appendix A. Dust assessment methodology

A.1. In order to determine the sensitivity of the area, different criteria are used for 'dust soiling', 'health effects of PM_{10}' and 'ecological effects'.

A.2. First, the sensitivity of receptors is determined. Table A.1, Table A.2 and Table A.3 show the criteria to determine the sensitivity of people and properties to dust soiling effects, the sensitivity of people to health effects of PM10 and the sensitivity of receptors to ecological effects, respectively.

Table A.1 Sensitivities of people to dust soiling effects

Sensitivity of receptor	Definition
High	• Users can reasonably expect a enjoyment of a high level of amenity; or • the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • Indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.
Medium	• Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • the appearance, aesthetics or value of their property could be diminished by soiling; or • the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. • Indicative examples include parks and places of work.

Sensitivity of receptor	Definition
Low	• The enjoyment of amenity would not reasonably be expected; or • property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.

Table A.2 Sensitivities of people to health effects of PM_{10}

Sensitivity of receptor	Definition
High	• Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.
Medium	• Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.

Sensitivity of receptor	Definition
Low	• Locations where human exposure is transient. • Indicative examples include public footpaths, playing fields, parks and shopping streets.

Table A.3: Sensitivities of receptors to ecological effects

Sensitivity of receptor	Definition
High	• Locations with an international or national designation and the designated features may be affected by dust soiling; or • locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List for Great Britain. • Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	• Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • locations with a national designation where the features may be affected by dust deposition. • An indicative example is an Area of Special Scientific Interest (ASSI) with dust sensitive features.
Low	• Locations with a local designation where the features may be affected by dust deposition. • An indicative example is a local Nature Reserve with dust sensitive features.

A.3. Second, the sensitivity of an area is determined by the sensitivity of receptors and the number of receptors existing in the area. Table A.4, Table A.5 and Table A.6 show the criteria used to determine the sensitivity of the area to dust soiling effects, to human health effects and for ecological effects, respectively.

Table A.4 Sensitivity of the area to dust soiling effect on people and property

Sensitivity of receptor	Number of receptors	Distance from the source in metres			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table A.5: Sensitivity of the area to human health effects

Sensitivity of receptor	Annual mean PM_{10}	Number of receptors	Distance from the source in metres				
			<20	<50	<100	<200	<350
High	>32 $\mu g/m^3$	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 $\mu g/m^3$	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 $\mu g/m^3$	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 $\mu g/m^3$	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	---	>10	High	Medium	Low	Low	Low
	---	1-10	Medium	Low	Low	Low	Low
Low	---	>1	Low	Low	Low	Low	Low

Table A.6: Sensitivity of the area to ecological effects

Sensitivity of receptor	Distance from the source in metres	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

A.4. Once the sensitivity of the area (to dust soiling, health and ecological effects) has been determined, the next step is to define the scale and nature of the works (at each construction stage), which determines the potential dust emission magnitude at that stage.

A.5. Table A.7, Table A.8, Table A.9 and Table A.10 show the criteria to determine the potential dust emission magnitude during demolition, during earthworks, during construction and for track out respectively.

Table A.7: Potential dust emission magnitude during demolition

Magnitude	Example definitions
Large	• Total building volume >50,000 m^3, • potentially dusty construction material (e.g. concrete), • on-site crushing and screening, • demolition activities >20 m above ground level.
Medium	• Total building volume 20,000 m^3 – 50,000 m^3, • potentially dusty construction material, • demolition activities 10-20 m above ground level.
Small	• Total building volume <20,000 m^3, • construction material with low potential for dust release (e.g. metal cladding or timber), • demolition activities <10 m above ground, • demolition during wetter months.

Table A.8: Potential dust emission magnitude during earthworks

Magnitude	Example definitions
Large	• Total site area >10,000m^2, • potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), • >10 heavy earth moving vehicles active at any one time, • formation of bunds >8m in height, • total material moved >100,000 tonnes.
Medium	• Total site area 2,500m^2 – 10,000m^2, • Moderately dusty soil type (e.g. silt), • 5-10 heavy earth moving vehicles active at any one time, • formation of bunds 4m - 8m in height, • total material moved 20,000 tonnes – 100,000 tonnes.
Small	• Total site area <2 ,500m^2, • soil type with large grain size (e.g. sand), • <5 heavy earth moving vehicles active at any one time, • formation of bunds <4m in height, • total material moved <20,000 tonnes, • earthworks during wetter months.

Table A.9: Potential dust emission magnitude during construction

Magnitude	Example definitions
Large	• Total building volume >100,000m3, on site concrete batching, sandblasting
Medium	• Total site area 25,000m3-100,000m3, potentially dust construction material (e.g. concrete), on site concrete batching
Small	• Total building volume <25,000m3 construction material with low potential for dust release (e.g. metal cladding or timber)

Table A.10 Potential dust emission magnitude due to track out

Magnitude	Example definitions
Large	• >50 HDV (>3.5t) outward (one-way) movements in any one day (i.e. worst case day), • potentially dusty surface material (e.g. high clay content), • unpaved road length >100m.
Medium	• 10-50 HDV (>3.5t) outward movements in any one day, • moderately dusty surface material (e.g. high clay content), • unpaved road length 50m – 100m.
Small	• <10 HDV (>3.5t) outward movements in any one day, • surface material with low potential for dust release, • unpaved road length <50m.
Note: These numbers are for vehicles that leave the site after moving over unpaved ground, where they will accumulate mud and dirt that can be tracked out onto the public highway.	

A.6. The last step is to determine the risk of dust effects from combining the sensitivity of the area to the scale and nature of the works.

A.7. Table A.11, Table A.12, Table A.13 and Table A.14 illustrate the matrix to determine the risk of dust effects during demolition, earthworks, construction and track out respectively. These tables are used for each of the potential dust effects: dust soiling, human health for PM_{10} and ecological effects.

Table A.11 Risk of adverse dust effects - Demolition

Sensitivity of area	Dust emission magnitude		
	Large	Medium	Small
High	High risk	Medium risk	Medium risk
Medium	High risk	Medium risk	Low risk
Low	Medium risk	Low risk	Negligible

Table A.12 Risk of adverse dust effects - Earthworks

Sensitivity of area	Dust emission magnitude		
	Large	Medium	Small
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible

Table A.13 Risk of adverse dust effects – Construction

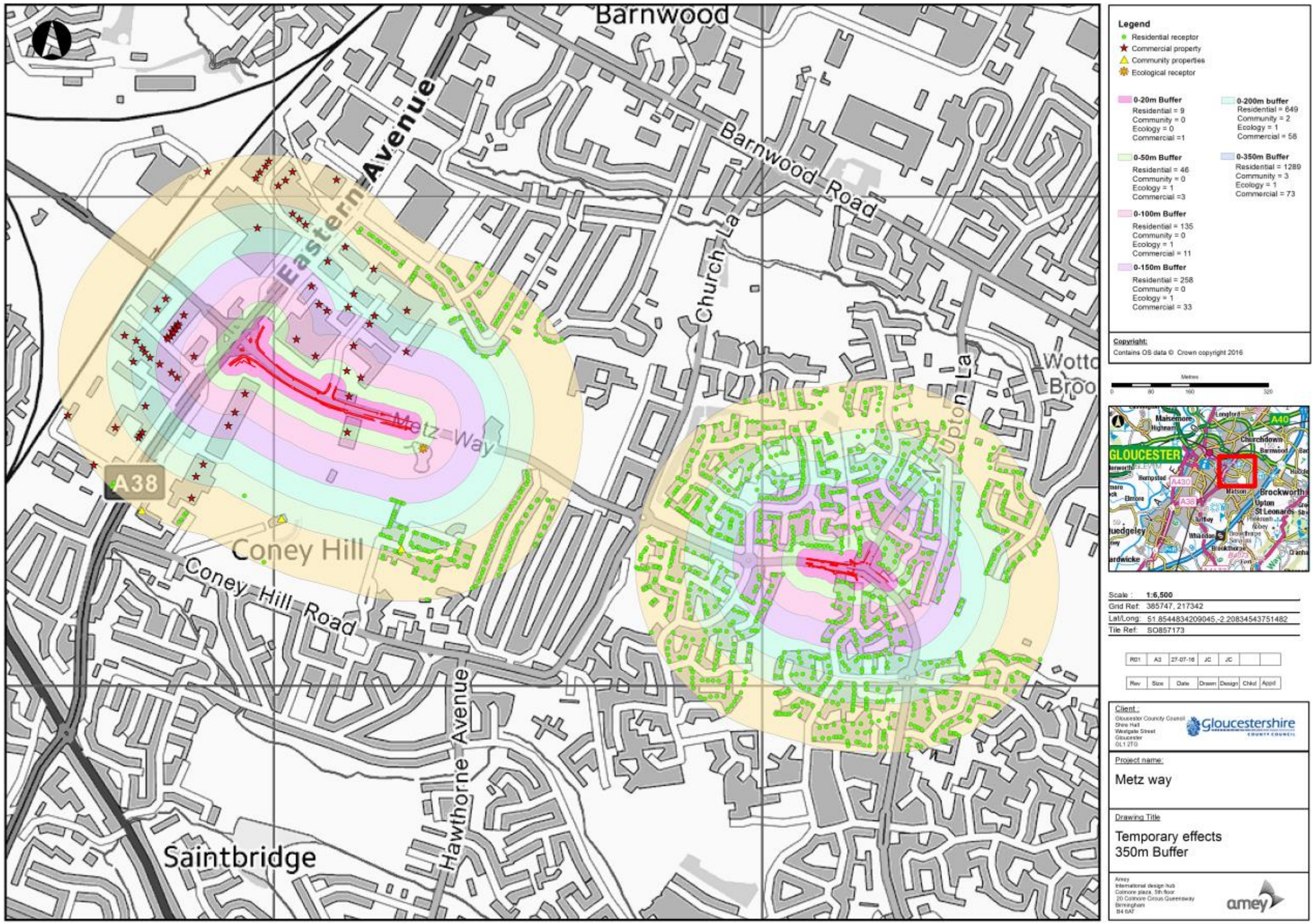
Sensitivity of area	Dust emission magnitude		
	Large	Medium	Small
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible

Table A.14 Risk of adverse dust effects - Track out

Sensitivity of area	Dust emission magnitude		
	Large	Medium	Small
High	High risk	Medium risk	Low risk
Medium	Medium risk	Low Risk	Negligible
Low	Low risk	Low risk	Negligible

A.8. Finally, depending on the output of the assessment of the risk of dust effects for each construction stage or in this case waste processing, the necessary site-specific mitigation is determined in order to render the residual effects not significant

Appendix B. Drawing


Barnwood
Eastern Avenue
Barnwood Road
Church La
Upton La
Metz Way
A38
Coney Hill
Coney Hill Road
Hawthorne Avenue
Saintbridge
Legend
Residential receptor
Commercial property
Community properties
Ecological receptor
0-20m Buffer
Residential = 9
Community = 0
Ecology = 0
Commercial =1
0-200m buffer
Residential = 649
Community = 2
Ecology = 1
Commercial = 58
0-50m Buffer
Residential = 46
Community = 0
Ecology = 1
Commercial =3
0-350m Buffer
Residential = 1289
Community = 3
Ecology = 1
Commercial = 73
0-100m Buffer
Residential = 135
Community = 0
Ecology = 1
Commercial = 11
0-150m Buffer
Residential = 258
Community = 0
Ecology = 1
Commercial = 33
Copyright:
Contains OS data © Crown copyright 2016
Metres
0
80
160
320
GLOUCESTER
A40
A430
A38
Scale : 1:6,500
Grid Ref: 385747, 217342
Lat/Long: 51.8544834209045,-2.20834543751482
Tile Ref: SO857173
R01 A3 27-07-16 JC JC
Rev Size Date Drawn Design Chkd Appd
Client :
Gloucester County Council
Shire Hall
Westgate Street
Gloucester
GL1 2TG
Gloucestershire
Project name:
Metz way
Drawing Title
Temporary effects
350m Buffer
Amey
International design hub
Colmore plaza, 5th floor
20 Colmore Circus Queensway
Birmingham
B4 6AT
amey

Legend
- Residential receptor
- Commercial property
- Community properties
- Ecological receptor

0-20m Buffer
Residential = 9
Community = 0
Ecology = 0
Commercial =1

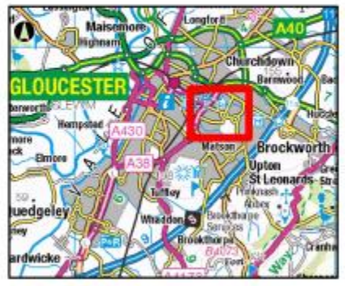
0-50m Buffer
Residential = 46
Community = 0
Ecology = 1
Commercial =3

0-100m Buffer
Residential = 135
Community = 0
Ecology = 1
Commercial = 11

0-150m Buffer
Residential = 258
Community = 0
Ecology = 1
Commercial = 33

0-200m buffer
Residential = 649
Community = 2
Ecology = 1
Commercial = 58

Metres 0 80 160 320



Scale : 1:6,500
Grid Ref: 385747, 217342
Lat/Long: 51.8544834209045,-2.20834543751482
Tile Ref: SO857173

Rev	Size	Date	Drawn	Design	Chkd	Appd
R01	A3	27-07-16	JC	JC		

Client :
Gloucester County Council
Shire Hall
Westgate Street
Gloucester
GL1 2TG

Project name:
Metz way

Drawing Title
Permanent effects
200m Buffer

Amey
International design hub
Colmore plaza, 5th floor
20 Colmore Circus Queensway
Birmingham
B4 6AT